A CRITICAL REVIEW OF COUNTRY RISK-PROFILES FOR LATIN AMERICA AND THE CARIBBEAN

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Abstract

National disaster risk-profiles can provide information on possible losses in case of future natural disasters. This can range from reporting likely damages in single 'what-if' scenario events, to reporting the likelihood and severity of losses to various sectors across a probabilistic set of events. The appropriate uses of these risk-profiles depend on the underlying quality of their analyses, and the purpose for which they will be used. This paper presents work to: collect, review and analyse publicly available national risk-profiles for the Latin America and the Caribbean (LAC) region; to make recommendations for their appropriate uses; and to deliver this information in an online platform to assist disaster risk managers to quickly find, understand, communicate, and report risk information, for single or multiple countries. The work considers earthquake, windstorm and flood, but for brevity this paper focuses on earthquake.

National risk-profiles have been collated for 43 countries of the LAC region. For each profile over 100 key metrics are investigated relating to each component of the underlying risk analyses (i.e. the exposure, hazard and vulnerability). Example metrics include the type and resolution of the underlying and reported hazard and exposure datasets, whether the reported risk is fully probabilistic, and the sectors and construction types captured in the vulnerability and exposure models. Seven potential risk-profile use-cases are identified, ranging from: low-resolution (e.g. national) qualitative Disaster Risk Management advocacy, to high-resolution quantitative financial planning purposes. The collated and analysed information is then used to define each risk-profile's suitability for each of the seven use-cases.

Common questions by disaster risk managers relating to national risk-profiles include: 'what risk-profiles are available for a given country?', 'what are the limitations of these studies, and what can/can't they be used for?', 'how do the results from these risk-profiles compare within a given country, and across multiple countries?'. To address these questions, the results of this review are presented in two ways: an overview of risk-profiles across all LAC countries; and more detailed country-specific risk-profile information, results and recommendations. Within the multi-country overview, a summary is provided of what risk, exposure, hazard, and vulnerability information is available for all LAC countries. Further plots are provided comparing exposure and risk results for the various risk-profiles across all LAC countries. For the country-specific reviews, a summary is provided for each country of: the available risk-profiles in that country with key technical information; which of the seven use-cases each profile is potentially suitable for; the risk and exposure results for each profile to demonstrate the range of results available.

This work is aimed at disaster risk managers looking to quickly understand, quantify, report and manage risk at a sub-national, national, or regional level, or researchers and risk modellers working in this field.

Keywords: Risk-Profile, Risk Management, Latin America, Caribbean

1. Introduction

Countries of the Latin America and Caribbean (LAC) region are exposed to high levels of risk from meteorological and geophysical hazards, which have significant negative impacts on their economic and fiscal stability. These natural hazards are being exacerbated by the adverse impacts of climate change - intensifying hazard patterns and increasing stress on water availability, coastal investments and livelihoods.

This paper presents work to collect, review and analyse publicly available national disaster risk-profiles. This work and the resulting recommendations are provided in an online decision-aid tool (the LAC Risk Viewer) to assist disaster risk managers to quickly find, understand, communicate, and report risk information, for single or multiple countries.

1.1. National Risk-Profiles

In the context of this paper 'disaster risk' refers to the frequency and severity of financial losses due to natural disasters. 'National risk-profiles' refers to studies which have calculated and reported losses to a country, at a national level, which may encompass both public and private assets depending on the profile.

A growing number of publicly available national risk-profiles exist. For example, Figure 1 shows that for Guatemala at-least four publicly-available risk-profiles are available for the same country, each with different results, sources, vintages and methodologies.

Figure 1: Examples of publicly available national disaster risk-profiles for Guatemala. At-least four risk-profiles are available, each with different results, sources, vintages and methodologies.

National risk-profiles contain critical information to inform Disaster Risk Management (DRM) and Disaster Risk Finance (DRF) decision-making. For disaster risk managers looking to understand and report on risk information for a country of region, this over-abundance of risk-profiles consistently raises the following questions:

1. What risk-profiles are available for a given country?
2. What can these profiles be used for, and what should they not be used for?
3. How do the results from different profiles compare for a given country?
4. How do risk results compare across multiple countries?

1.2. Users and Use-cases of Disaster Risk Information

This work is aimed at assisting disaster risk managers to answer the four questions above. Here, 'disaster risk managers' refers to those looking to understand, quantify, report and manage risk at a sub-national, national, or regional level. This might include, for example:

- Risk managers from the government of a given country. E.g. from a Ministry of Finance considering disaster risk financing options, or from a national civil protection agency considering disaster risk reduction and response requirements.
- Risk managers for regional entities such as CDEMA (Caribbean Disaster Emergency Management Agency) and CCRIF (Caribbean Catastrophe Risk Insurance Facility).
- Staff at multilateral development banks (MDBs), such as The World Bank, who are designing and running lending or technical assistance projects in client countries.

Risk managers need to find, understand, communicate, and report risk information for many use-cases: from low-resolution (e.g. national) qualitative Disaster Risk Management (DRM) advocacy; to high-resolution quantitative analysis for Disaster Risk Finance (DRF) decision-making. For example, there are national reporting requirements to report progress towards achievement of the Sendai Framework targets and relevant targets of the Sustainable Development Goals (SDGs), which involves identifying key risks to a country and quantifying those risks in monetary terms with probabilities of occurrence [1].

1.3. Aim of This Study

The work presented in this paper aims to assist disaster risk managers answer the four questions above, relating to the availability, use, selection and comparison of publicly available national disaster risk-profiles. This is to enable risk managers to quickly find, understand, communicate, and report risk information for their specific use-cases, for single or multiple countries across the Latin America and Caribbean (LAC) region.

To achieve this, publicly available risk-profiles for 43 countries of the LAC region have been compiled and analysed for earthquake, windstorm and flood. To allow risk managers to access and interrogate this information, an online decision-aid tool, the LAC Risk Viewer, has been created which:

- Presents and compares results from the various profiles within a given country and across multiple countries,
- Summarizes underlying technical information with additional comments and insights, and
- Provides recommendations on suitable risk-profiles for specific use-cases.

It is important to note that definitive recommendations for which *results* of the available profiles may be considered 'correct', are not provided. Instead, the data, technical information and insights provided in the LAC Risk Viewer aim to help risk managers quickly understand: the range of results available; key strengths, limitations, and judgements underpinning the risk-profiles; and the assumptions and judgements that have the most material impact on the risk-profile results.

The recommendations on the suitable profiles for different use-cases advise risk managers on the different purposes that each risk-profile could be considered for. Equally importantly, this work also highlights the key limitations of the available risk-profiles and advises on what they should *not* be used for. This helps risk managers ensure that, where necessary, targeted risk-studies can be initiated and alternative risk management processes can be put in place to allow for uncaptured risks to be adequately measured and incorporated into the country's overall DRM and DRF frameworks.

Note that this work focuses on *risk*-profiles (i.e. those reporting financial losses), which is distinct from *hazard* information, such as seismic ground-shaking intensity maps, hurricane windspeed maps, flood depth/extent maps. Risk-profiles incorporate this hazard information in calculation of financial losses. Risk information may also be expressed as other forms of loss (e.g. casualties) but only financial losses are considered in this paper. Note also that sub-national risk-profiles are not considered.

2. Risk-Profile Collation and Analysis

2.1. Scope

Information has been collected, and analysed for the perils of earthquake, windstorm and flood, though for brevity this paper focuses mainly on earthquake. Table 1 shows the risk-profiles that have been considered in this study. 43 countries of the Latin America and Caribbean (LAC) region have been considered. This information is collated and presented in the online tool so as to quickly answer the question "what risk-profiles are available for a given country?" (see Section 3 below for a case-study example).

To answer the questions, "how do the results from different profiles compare for a given country?", and "how do risk results compare across multiple countries?", then exposure and loss results are compiled for all risk-profiles considered. It is important to note that direct comparison of results is complicated as the definitions of the underlying exposures differ by risk-profile (Table 1), which affects both the exposures and the subsequent losses. Furthermore, the risk-profiles have different vintages and so capture the exposure in different years. This can be somewhat addressed by normalizing exposure for vintage, and normalizing losses for the underlying exposure differences. Example comparison of normalized losses is presented in Section 0.

Table 1: Earthquake risk-profiles considered in this study.

Risk-Profile	Profile Description	Exposure Definition
CAPRA	The CAPRA probabilistic loss assessment platform is an initiative that aims to strengthen institutional capacity to integrate risk information into development policy. Initiated in 2008 by CEPREDENAC, UN ISDR, IADB, and the World Bank, now managed by UniAndes.	Buildings and Infrastructure (no contents): Residential, Commercial, Industrial, Education (public/private), Health (public/private), Government, Infrastructure
CDRP	Country Disaster Risk-Profiles provide probabilistic risk at a national level, and are a product of the DRAS (Disaster-Resilience Analytics and Solutions) KSB (Knowledge-Silo Breaker) of the World Bank's Global Practice for Urban, disaster risk management, Resilience and Land (GPURL).	Buildings Only: Residential buildings (single-family houses; multi-family buildings) & Non-Residential buildings (Industrial; Commercial-Retail; Commercial or other type of Warehouse incl. Agricultural; Commercial – Offices (incl. government administration & hotels); Critical Buildings – Educational, Health, Worship, Culture, Utilities, etc.)
GAR	The Global Assessment Report 2015 on Disaster Risk Reduction (GAR) is a biennial product of UN DRR, informing on global risks to natural disasters. The 2015 report is used as it is the last version to have provided global risk information for multiple perils.	Buildings only: Residential (4 income sub-classes), Commercial, Industrial, Education, Health, Public Buildings
GEM	The Global Earthquake Model is a non-profit public-private partnership initiated in 2009 for developing data and tools for seismic risk assessment.	Buildings and Contents combined: Residential, Commercial, Industrial

It is also important to note that this work focuses on *publicly available* risk-profiles. Proprietary models and datasets exist, for example catastrophe models used by the insurance sector or national datasets that are not released to the public. However, many of these proprietary models and datasets are not readily available for use by national governments or the risk manager examples provided in Section 4, and so they have not been considered here.

2.2. Model Components

In this study, data is collected and analysed for each risk-profile against the four model components, shown in the pseudo-equation below (Eq (1)).

$$\text{Risk} = \text{Hazard x Vulnerability x Exposure} \qquad (1)$$

Hazard refers to, for example, seismic ground-shaking intensity, wind-speed, and flood depths/extents. Exposure, in this case, refers to the total amount of capital goods currently present within a country, which may encompass public, residential, commercial, industrial assets, where the definitions of these asset-classes may vary according to the risk-profile. Vulnerability describes how severely a building is likely to be damaged in a given event, often expressed as a Mean Damage Ratio (MDR) which is the expected loss as a proportion of the property replacement value. Risk combines the other components to provide the frequency and severity of losses.

2.3. Analysis of Model Suitability

In order to answer the question "what can the profiles for a given country be used for, and what should they not be used for?", the underlying data and methodologies of each risk-profile are analysed to determine whether that profile is suitable to be used for the use-cases shown in Table 2.

Table 2: Risk products and use cases for risk-profiles, ranging from high-level qualitative studies for DRM dialogue to detailed quantitative analysis for financial and fiscal planning (from [2]).

Product	Use-Case	Scale	Technical Requirements	Cost
Qualitative national risk-profile	For advocacy and initiation of DRM dialogue	National	Low: Requires global, regional, and/or national data sets	$
Community-based disaster risk assessment	To engage communities, communicate risk, and promote local action	Community level	Low: Typically based on historical disaster events	$
Quantitative national risk-profile	For advocacy and initiation of DRM dialogue based on quantitative assessment	National	Low-moderate: Requires global, regional, and/or national data sets	$$
Asset-level risk assessments, including cost-benefit and engineering analysis	To inform design of building-level/asset-level risk reduction activities and promote avoidance of new risk	Building / infrastructure level	Moderate-high: Requires high-resolution local data for large spatial areas with clear articulation	$$
Macro-level risk assessment for risk reduction, including cost-benefit analysis	To inform urban/regional risk reduction measures	Urban, regional, national	Moderate-high: Requires moderate to high resolution across large spatial areas	$$$
Risk identification to identify critical infrastructure and establish early warning systems	To inform preparedness and risk reduction, based on understanding of potential damage at the regional/local level	Urban, regional, national	Moderate-high: Requires asset-level information across large spatial areas	$$-$$$ (depend on scope)
Catastrophic risk assessment for financial planning	For financial and fiscal assessment of disasters and to catalyze catastrophe risk insurance market growth	National to multi-country	High: Requires high-resolution, high-quality data of uncertainty	$$$

To define whether a risk-profile is potentially suitability for each use-case then the underlying methodologies and data sources/types are assessed for 280 country risk-profiles, where each country/peril/study combination is counted as an individual profile. This forms a database of metadata for the 280 profiles and over 100 fields, where some examples of these fields (or criteria) are given in Table 3.

For each risk-profile a score is allocated based on the data for each criteria, where a higher score indicates that that particular data-type/source or methodology may be considered more suitable for the specific use-case. For example, for the use-case of financial planning then a fully probabilistic hazard component based on a stochastic event set scores higher than non-probabilistic models (e.g. historic scenarios) or those based only on return periods (e.g. some flood maps).

For each profile, scores are allocated against all criteria which are then synthesized so that for a given country, peril and use-case then the risk-profiles can be ranked according to their suitability. This method of ranking based on metadata scoring is similar to that used in [3].

The criteria against which the profiles are assessed, are chosen to extract key information related to the suitable uses of the profiles. And the scoring system is chosen to place greater weight on the most material criteria, and to reward assumptions, data and methodologies which are most suitable for the selected use-case. In this way the scoring system is calibrated to provide a critical appraisal of the most material aspects of the risk-profiles. For example, the scoring for vulnerability criteria is adapted from the MOVER system (Multi-Hazard Open Vulnerability Platform for Evaluating Risk [4]) which scores vulnerability functions based on their geographical and asset relevance to their final application, and the quality of the underlying analysis and data.

Table 3: Example criteria by which each risk-profile is assessed. The full assessment encompasses >100 criteria but only a small selection are shown here for brevity.

Component	Field (criteria)	Description
Risk	R_probabilistic	Whether the risk component is fully probabilistic (based on a stochastic event set), probabilistic based on return periods, or non-probabilistic.
	R_calibrated	Whether the profile Exceedance Probability (EP) curve is calibrated against historical losses.
	R_resolution_reported	The resolution of the reported risk results (e.g. national, admin 3, 1km grid etc).
	…etc…	(a number of other criteria)
Hazard	H_Type	E.g. seismic hazard maps with/without stochastic event set provided.
	H_site	Whether site effects are considered.
	H_resolution_reported	The resolution of the reported hazard results.
	…etc…	(a number of other criteria)
Vulnerability	V_derived	How the curves have been derived (e.g. general analytical fragility curves with an assumed loss model applied globally, or empirical curves based on local loss data).
	V_con	The number of construction classes considered (and similarly for other primary characteristics).
	V_local	Whether the vulnerability curves have been generated specifically for local asset typologies, or are general curves from other countries.
	…etc…	(a number of other criteria)
Exposure	E_derived	How the exposure has been calculated (e.g. population, capital stock, economic activity data etc).
	E_resolution	The resolution of the underlying exposure model (e.g. 1km grid etc).
	E_socioeconomic	Whether the exposure model considers poverty, income-bracket or other socioeconomic indicators.
	…etc…	(a number of other criteria)

The need to efficiently cover such a large breadth of countries, perils and profiles precludes conducting detailed individual model-validations, which would require a detailed, resource-heavy manual assessment of individual results and the scientific-basis of underlying model assumptions. Instead, the suitability ranking method described above is designed to simultaneously synthesize data from a large number of profiles, for multiple perils, so as to allow risk managers in any country in the LAC region to quickly answer the question "what can I use the available risk-profiles for, and what should I not use them for?" (e.g. to inform the risk-manager whether it is necessary to fund a new, targeted study for a particular use-case).

It should therefore be emphasized that this suitability scoring method does not assess the final *results* of the profile, i.e. assessing the data sources/types and methodologies in this way does not indicate with certainty whether the profile loss results may be considered 'too high/low'. It rather indicates whether the profile should be considered for a particular use-case. For example, a profile with a low-resolution hazard component for a high-resolution peril (e.g. flood) would indicate that it is not suitable to be used for asset-level risk analysis of individual infrastructure facilities.

In this way, the suitability scoring presented above aims to help risk managers better understand the uses and limitations of the available risk-profiles, the data used as inputs, and key underpinning assumptions.

2.4. Supplementary Analysis of Model Components

One key output of the online tool is to provide risk-managers with key information and recommendations regarding each risk-profile. This information is drawn from the database described in Section 2.3, and additionally from conducting supplementary analysis of model components.

The underlying component data (e.g. hazard maps, or vulnerability functions) are not available for analysis consistently across all profiles. Therefore, the supplementary analysis conducted is not comprehensive and is *not* designed to define which results are the most 'accurate', but instead to inform comments to give risk managers additional insights into the underlying data and assumptions that underpin the profiles.

For example, for further analysis of the hazard component then differences in the ground-shaking intensities are examined and observations made. This comparison of profiles' hazard layers for multiple return periods involves both: GIS overlay of the profiles and additional sources where available (Figure 2); and analysis of summary statistics on the range of seismic intensities within each country, focussing on locations of high exposure. Note that this is an example where the GIS file of the hazard layer for the CAPRA/IDB study for Argentina could not be obtained and so could not be included in the comparison. The resulting comments on the hazard components of each of the compared risk-profile, which are provided to the risk-manager via the online tool, are shown in Table 4.

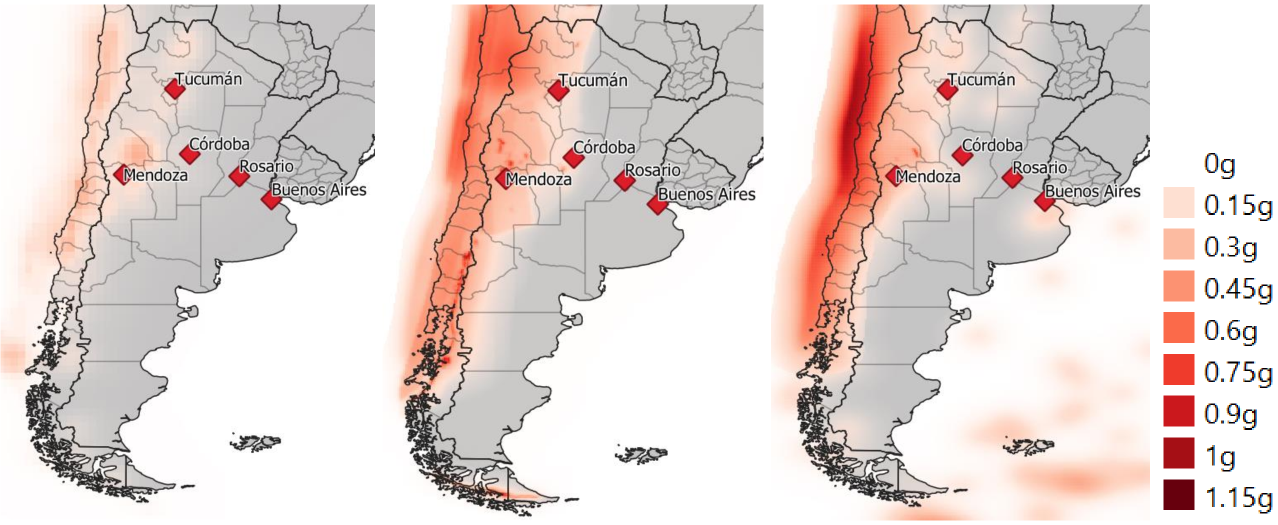

Figure 2: Example comparison of seismic hazard maps for Argentina at the 475-year return period for GAR_{2015} (left), GEM (centre) and USGS [5] (right). Both the GAR and GEM hazard maps show low/no seismicity to the East of Argentina, whereas the USGS map does show some seismicity extending further into the North-East of the country, for example around Buenos Aires.

For supplementary analysis of the vulnerability component then various high-level checks of the vulnerability functions are made, where the underlying functions are available. Example checks include qualitative sensitivity analyses of primary characteristics (e.g. construction type, occupancy, year built etc), picking out trends in the vulnerability functions, and making comparison to alternative curves available in the literature.

Supplementary analysis of the exposure component involves comparison of risk-profile exposure results with an alternative source, CATDAT. CATDAT has been built up over many years and contains historical loss information parsed with capital stock estimates for various sectors, and GDP at subnational levels of resolution. The capital stock modelling comes from the Perpetual Inventory Method and detailed investment data, compared against UCC data [6], [7].

It is important to note that the comments and insights provided to the risk managers are based on the authors' own interpretation of the results and documentation that is available for each risk-profile, at the time of writing.

The comments provided as a result of this analysis are not intended to inform which of the available profiles' component results are to be considered 'correct', but instead to inform the risk-manager how results compare to alternative views, and give some insight into the underlying assumptions and their potential effects. This is to help guide the risk manager to better understand the risk-profiles, and to form the basis for further investigation if needed.

Table 4: Argentina hazard component comments for GAR and GEM, provided to risk-managers.

Risk-Profile	**Hazard Component comment provided to Risk-Manager**
GAR	Ground-shaking intensities are generally lower than found in alternative hazard maps, especially in the East of Argentina (e.g. Buenos Aires) as long-distance effects from the SA West-coast subduction zone do not appear to be accounted for. Short return period (1973-2013) regarding the definition of Gutenberg-Richter seismicity relations for countries. Coarse seismotectonic zones result in a lack of variability in local seismic hazard that can lead to unrealistic local results. Inhomogeneous representation of subduction zone seismicity (seismicity along the subduction zone varies more than expected). In areas of low seismicity then unknown fault locations and only a small number of historical events can lead to "bullseye" effects, where seismicity is focussed around past event-locations.
GEM	Seismicity appears lower in the East of Argentina (e.g. Buenos Aires) when compared with some alternative hazard maps, and long-distance effects of the SA West-coast subduction zone do not appear to be considered. Creation of a homogenised earthquake catalogue (1471-2018) with catalogue completeness analysis and mapping. Active fault mapping. Seismic source zonation (subduction, in-slab, intra-slab) and a, b value seismicity analysis per zone. Where discrete tectonic features unknown, smooth seismicity approaches deficient in regions with insufficient observations to capture tectonic features and their earthquake triggering capabilities. This leads to so-called "bullseye" features in regions where maybe only 1-2 major events have been recorded.

3. Overview of Risk-Profiles and Results for Latin America and the Caribbean

3.1. Model Availability

Figure 3 shows an overview of the number of publicly available risk-profiles available for each country. For earthquake and windstorm, the Central America countries have the highest number of public risk-profiles available. For flood, the North-Western part of South America has the highest number of public risk-profiles available.

Figure 3: Overview of the number of risk-profiles available for each country for earthquake (left), windstorm (centre), and flood (right). Access the LAC Risk Viewer to view these maps interactively.

Figure 4 shows two example overviews of available risk-profiles for two countries. Figure 5 shows an overview of the data available for multiple countries. The figure shows which component is available in each country. Each coloured block within the figure is made up for four parts, which show results for the following 4 yes/no questions (green = 'yes', red = 'no'):

- Are component results presented in *any* Risk-Profile for the country? (e.g. "are seismic hazard maps presented in any study for Barbados?")
- Is the underlying data available to download? (e.g. "can I download the seismic hazard maps for Barbados?")
- Is the data up-to-date? (2015+)
- Is the data high-resolution? (for earthquake or windstorm: 15 arc-seconds (~500m near the equator). For flood: 3 arc-seconds (~100m near the equator))

Peru

Risk Profile Overview:

Study	Vintage	Earthquake	Windstorm	Flood
AQUEDUCT	2018			✓
FATHOM*	2018			✓
GAR15	2015	✓	✓	✓
GEM	2018	✓		
IDB	2014	✓		
IDB	2015			✓

* Note: FATHOM flood maps are not risk profiles, but only contain flood hazard information. Included as global maps accessible to World Bank staff.

Costa Rica

Risk Profile Overview:

Study	Vintage	Earthquake	Windstorm	Flood
AQUEDUCT	2018			✓
CAPRA	2012	✓	✓	
CDRP	2015	✓	✓	
FATHOM*	2018			✓
GAR15	2015	✓	✓	✓
GEM	2018	✓		

* Note: FATHOM flood maps are not risk profiles, but only contain flood hazard information. Included as global maps accessible to World Bank staff.

Figure 4: Example overviews of the available risk-profiles, their vintages and the perils they cover for Peru (left) and Costa Rica (right).

Figure 5: Overview of data availability for each country. Each block indicates answers to 4 yes-no questions (given in the text) relating to availability of data for the given peril and model component, for *any* profile in each country. View this table within the LAC Risk Viewer to interrogate the information for any country/peril/component.

3.2. Comparing Model Results

It is very important to note that direct, like-for-like comparison of results is not possible as the definitions of the underlying exposures differ by risk-profile (Table 1). These differences affect both the exposures and the subsequent losses, so comparing absolute values may be misleading. To somewhat overcome this, loss results are normalized by expressing losses (AAL, PML) as a multiple of the underlying exposures.

Furthermore, the risk-profiles have different vintages and so capture the exposure in different years. This affects absolute losses, but is less of a concern for normalized losses (as they are normalised to exposure for the same year). Exposure results can be somewhat normalized for vintage by expressing exposure as a multiple of GDP for the same year. Note that this vintage-normalization does not address the issue of different definitions of exposure, so this cannot be considered a like-for-like comparison but can still be informative.

Example comparisons of normalised losses and vintage-normalised exposures are presented in Figure 6. Considering multiple perils side-by-side allows risk managers to quickly identify the most material hazards and their relative risks.

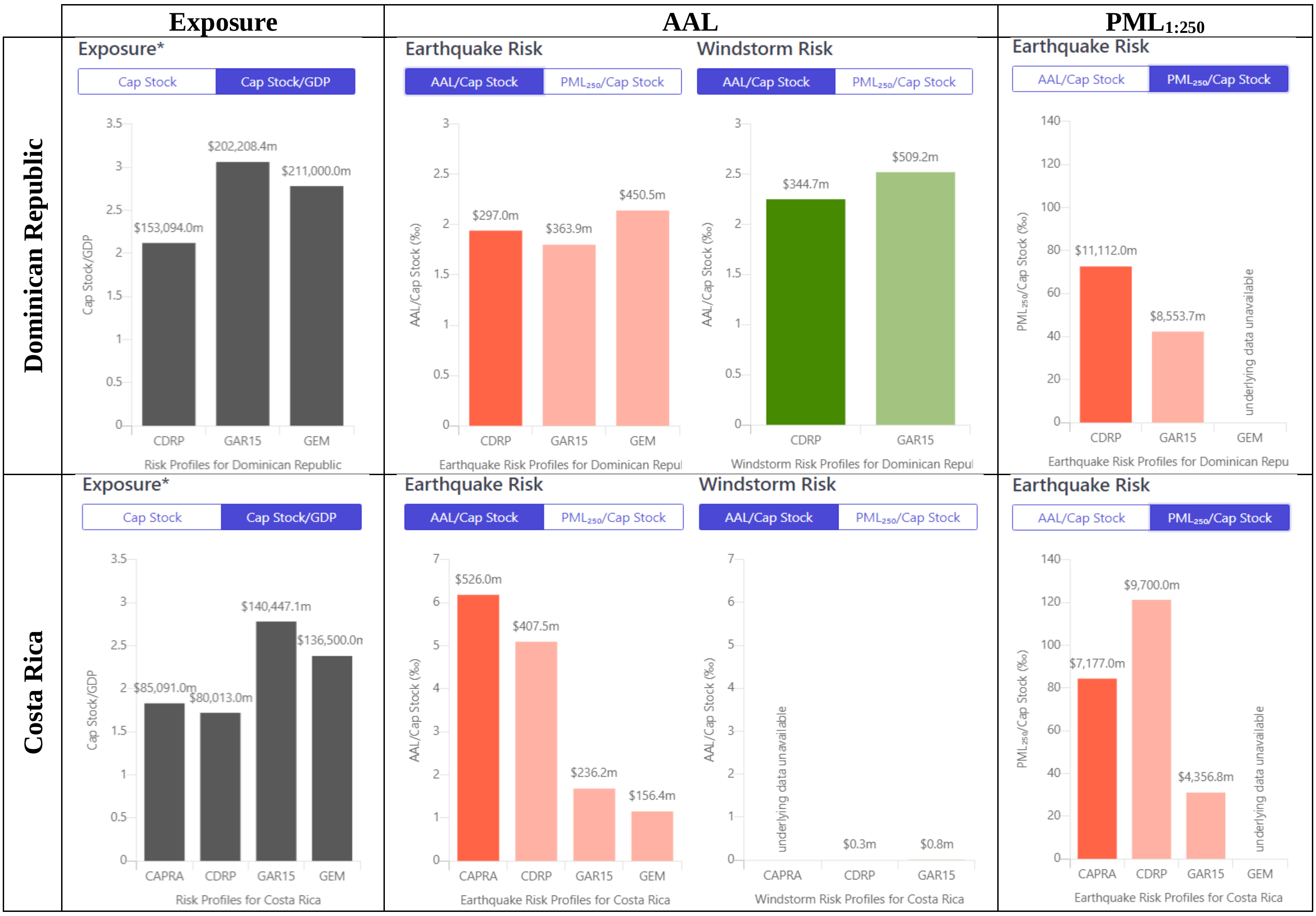

Figure 6: A comparison of exposure and loss results for Earthquake and Windstorm for the Dominican Republic (top) and Costa Rica (bottom). For Dominican Republic, earthquake risk is comparable to windstorm at the AAL, and all profiles estimate AAL at around 0.2% of the exposure (where the exposure estimates range from 2-3 times GDP). For Costa Rica, earthquake risk is significantly greater than windstorm but there is a high variability in the available AAL estimates (0.1-0.6% of total exposure) and the order of the profiles (from higher to lower losses) is different for AAL and PML, indicative of the different shapes of the profiles' EP curves.

It should be emphasized that the suitability scoring method described in Section 2.3 does not assess the final *results* of the profile (i.e. assessing the data sources/types and methodologies in this way does not indicate with certainty whether the profile loss results may be considered 'too high/low'). However, comparing losses from multiple risk-profiles shows the spread of estimates available for a given country which, together with the information obtained from the suitability analysis and supplementary component analysis, helps the risk-manager to begin to form their own view of risk and enables the most material, complex and uncertain risks to get the most attention.

Figure 7 shows examples of normalized exposure and loss results across multiple countries (note the previously discussed issues due to different definitions of exposure, Table 1). A risk manager may wish to compare results (both normalized and absolute) across multiple countries if they: are responsible for risk for a region (e.g. CCRIF); want to understand how the risk in a given country compares to others; or to identify trends and outliers in the various results.

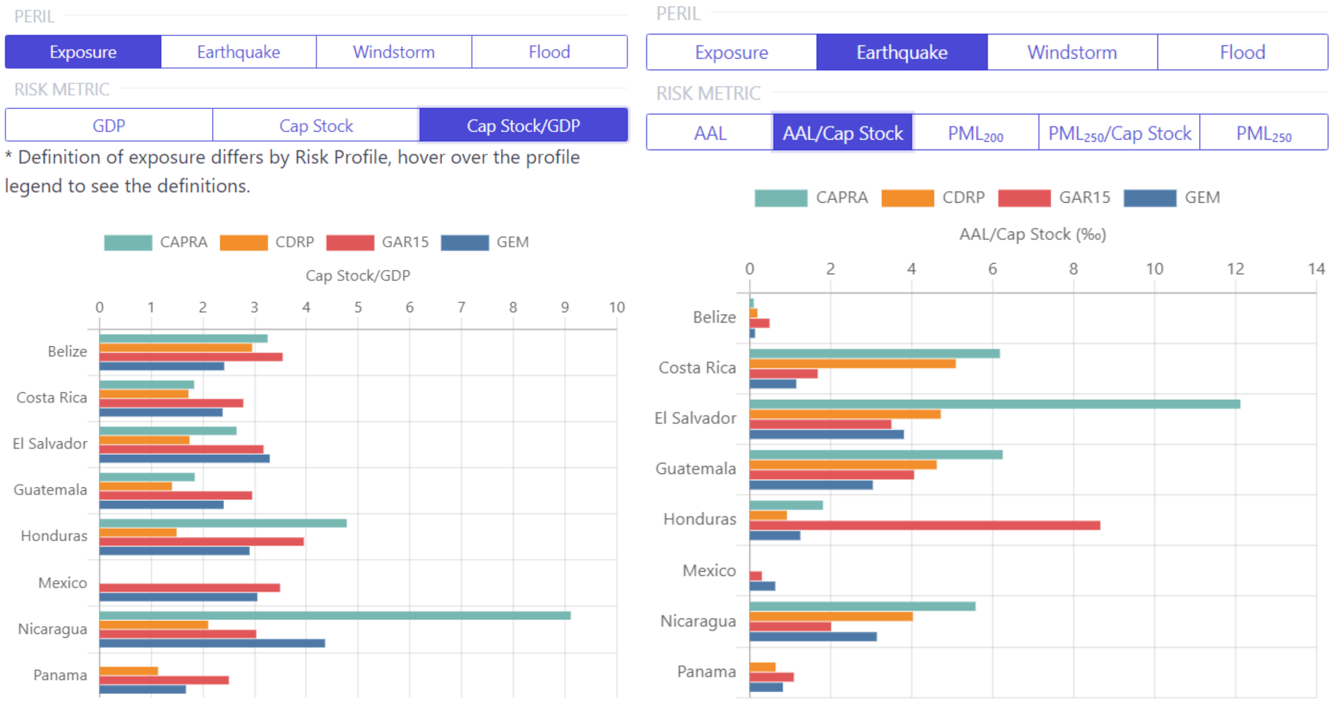

Figure 7: Comparison of normalized exposure results (left) and earthquake loss-results (right) for the available risk-profiles for Central America. Comparison shows, for example, outliers such as the higher relative exposure for CAPRA for Nicaragua, or higher relative loss for GAR for Honduras. Note that outliers do not indicate that results are 'wrong', but serve as a basis for further, more details investigation.

4. Online Decision-Aid Tool: The Lac Risk Viewer

In order to enable risk managers to answer the questions outlined in Section 1.3, the analysis, results, and recommendations described in this paper are provided in an online decision-aid tool: The LAC Risk Viewer. This LAC Risk Viewer is designed to assist the risk manager to quickly access, evaluate, use, and report disaster risk information.

All figures in section 3 are direct screenshots of the LAC Risk Viewer. In addition to the figures shown in this paper, additional technical information is provided from the database described in Section 2.3 and comments and recommendations are provided as a result of the analysis described in Sections 2.3 and 2.4.

The tool aims to help risk managers understand: key strengths, limitations, and judgements within the risk-profiles; and assumptions and judgements that have the most material impact on the risk-profile results. In order to do this the user is guided to choose their country of interest and the use-case for which they require risk-information (Table 2), so that specific information and recommendations can be provided. This specific information can then be downloaded as a customized pdf report which contains all of the same key results and recommendations, presented for communication with non-technical audience. This report is intended as a reference for the risk manager, but also as a communication aid for discussion and dissemination with other risk management stakeholders.

5. Conclusions

This work is aimed at assisting disaster risk managers to quickly find, understand, communicate, and report risk information, to answer the following questions:

1. What risk-profiles are available for a given country?
2. What can these profiles be used for, and what should they not be used for?
3. How do the results from different profiles compare for a given country?
4. How do risk results compare across multiple countries?

To achieve this, publicly available risk-profiles for 43 countries of the Latin America and Caribbean (LAC) region have been compiled and analysed. An online decision-aid tool, The LAC Risk Viewer, has been created which presents results from the various profiles and provides recommendations on appropriate risk-profiles for each country for different use-cases. The LAC Risk Viewer also creates customized download reports to act as a reference and communication aid for discussion with other risk management stakeholders.

If the reader is interested in learning more about this work or gaining access to the LAC Risk Viewer then please get in contact with the authors.

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